

Modernized Incident Waste Decision Support Tool (I-WASTE) Project Report



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Modernized Incident Waste Decision Support Tool (I-WASTE) Project Report

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FOREWORD

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The Center for Environmental Solutions and Emergency Response (CESER) within the Office of Research and Development (ORD) conducts applied, stakeholder-driven research and provides responsive technical support to help solve the Nation's environmental challenges. The Center's research focuses on innovative approaches to address environmental challenges associated with the built environment. We develop technologies and decision-support tools to help safeguard public water systems and groundwater, guide sustainable materials management, remediate sites from traditional contamination sources and emerging environmental stressors, and address potential threats from terrorism and natural disasters. CESER collaborates with both public and private sector partners to foster technologies that improve the effectiveness and reduce the cost of compliance, while anticipating emerging problems. We provide technical support to EPA regions and programs, states, tribal nations, and federal partners, and serve as the interagency liaison for EPA in homeland security research and technology. The Center is a leader in providing scientific solutions to protect human health and the environment.

This report provides an overview of EPA's Incident Waste Decision Support Tool (I-WASTE) that provides important information to support planning and response decision-making. I-WASTE features calculators to generate waste quantity estimates, provides databases of treatment and disposal facilities, and includes a quick reference to technical information, regulations, and guidance to address the safe and efficient removal, transport, and disposal of waste materials. The objective of the decision support tool is to help reduce restoration time and expense by providing quick access to information that will inform the decision-making process for incident waste management. Instructions for using I-WASTE and associated technical documentation describing the technology architecture are also included.

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CESER, Center for Environmental Solutions and Emergency Response

HSMMD, Homeland Security and Materials Management Division

OLEM, Office of Land and Emergency Management

ORCR, Office of Resource Conservation and Recovery

USDA, United States Department of Agriculture

APHIS, Animal and Plant Health Inspection Service

CPHEA, Center For Public Health And Environmental Assessment

PESD, Pacific Ecological Systems Division

OEM, Office of Emergency Management

CMAD, Consequence Management Advisory Division

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ACRONYMS AND ABBREVIATIONS

AIST	Association for Iron and Steel Technology
API	application programming interface
C&D	construction and demolition
CWT	centralized waste treaters
DDRT	Disaster Debris Recovery Tool
DHS	U.S. Department of Homeland Security
DOE	U.S. Department of Energy
EAf	electric arc furnace
ECHO	Enforcement and Compliance History Online
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FLIGHT	Facility Level Information on GreenHouse gases Tool
FOTW	federally owned treatment works
HMIWI	Hazardous Medical Infectious Waste Incinerators
HSRP	Homeland Security Research Program (EPA)
JSON	JavaScript object notation
I-WASTE	Incident Waste Decision Support Tool
MSW	municipal solid waste
NARA	North American Renderers Association
NEI	National Emissions Inventory
ORD	Office of Research and Development (EPA)
OTD	Operational Technology Demonstration
PHP	Hypertext Preprocessor
POTW	publicly owned treatment works
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
URL	Uniform Resource Locator
USDA	U.S. Department of Agriculture
WARRP	Wide Area Recovery and Resiliency Program
WME	Waste Materials Estimator

EXECUTIVE SUMMARY

This project supports United States Environmental Protection Agency's (EPA's) Homeland Security Research Program (HSRP) and the Center for Environmental Solutions and Emergency Response, Homeland Security and Materials Management Division's strategic goals as described in detail in the Homeland Security Strategic Research Action Plan (U.S. EPA, 2020). This work is pertinent to Long-Term Goal 2, which states, "The [EPA] Office of Land and Emergency Management (OLEM) and other clients use HSRP products and expertise to improve the capability to respond to terrorist attacks affecting buildings and the outdoor environments."

Incidents of national significance that would result in a direct or indirect environmental impact can be caused by industrial accidents; natural disasters such as hurricanes, floods, wildfires, and earthquakes; terrorist attacks using chemical, biological, radiological, or nuclear weapons; and disease outbreaks or intentional contamination impacting the safety of the U.S. food supply or agricultural sector. Past experience with wide-area disasters has underscored the need for emergency response plans to include tools that will assist decision makers in effectively managing waste from incidents of national significance to minimize threats to human health and the environment.

The primary decision makers in the waste management process will be: 1) federal and state emergency response authorities and property owners who have to decide the most appropriate decontamination methods and disposal of the resulting waste(s); 2) tribal, state, and local permitting agencies who have to make decisions about which facilities will be allowed to manage the waste(s); and 3) the waste management industry that will be called upon to accept and safely treat or dispose of decontamination waste(s) without affecting the operation of its facilities and without violating any of its environmental permits. The individuals tasked with removal and disposal of waste materials will need to access a great deal of technical information, regulations, and guidance to work through the series of decisions needed to assure safe and efficient removal, transport, and management of these materials.

EPA's Incident Waste Decision Support Tool (I-WASTE) provides important information to support planning and response decision-making and features calculators to generate waste quantity estimates, provides databases of treatment and disposal facilities, and includes a quick reference to technical information, regulations, and guidance to address the safe and efficient removal, transport, and disposal of waste materials. The objective of I-WASTE is to help reduce restoration time and expense by providing quick access to information that will inform the decision-making process for incident waste management. I-WASTE supports EPA's goals to strengthen resilience to disasters and complements other EPA tools such as the Disaster Debris Recovery Tool and the All Hazards Waste Management Planning Tool.

1 INTRODUCTION

In the event of an incident of national significance involving the deliberate or accidental contamination of buildings, outdoor areas, agricultural critical infrastructure, transportation infrastructure, or water treatment/distribution infrastructure, there will be a process of cleaning up the contaminated site and restoring it to normal operation. After the initial response and decontamination activities have taken place, the management of waste and debris is nominally the final step in the restoration process. However, there are several waste management issues that are inextricably linked with the entire cleanup process, including:

- The nature of the event and its impact on waste quantities and degree of contamination;
- The impact of decontamination technologies on waste quantities and waste characteristics;
- The consideration of tradeoffs between decontamination costs and treatment/disposal costs; and
- The impact of waste characterization, decontamination effectiveness, and contamination levels on the classification of waste for transportation, treatment, and disposal.

Although decontamination activities might have been completed, the properties of some contaminated materials, laboratory capacity limitations, or limitations in analytical techniques might be such that no guarantee can be made that no residual agent is present (e.g., in porous materials). Ideally, the decontaminated materials should be characterized to determine the waste class (e.g., hazardous waste, solid waste, special waste), so that waste management options can be explored, but there is the possibility that decontaminated waste might have to be managed as if it were still contaminated due to the lack of characterization.

The primary decision makers in the waste management process will be:

1. Federal and state emergency response authorities and property owners who decide the most appropriate decontamination methods and disposal of the resulting waste(s);
2. Tribal, state, and local permitting agencies who make decisions about which facilities will be allowed to manage the waste(s); and
3. The waste management industry that will be called upon to accept and safely treat or dispose of decontamination waste(s) without affecting the operation of its facilities and without violating any of its environmental permits.

The individuals tasked with removal and disposal of waste materials will need to access a great deal of technical information, regulations, and guidance to work through the series of decisions needed to assure safe and efficient removal, transport, and management of these materials.

1.1 Purpose

Incidents of national significance that would result in a direct or indirect environmental impact can be caused by industrial accidents; natural disasters such as hurricanes, floods, wildfires, and earthquakes; terrorist attacks using chemical, biological, radiological, or nuclear weapons; and

disease outbreaks or intentional contamination impacting the safety of the U.S. public, the food supply, or agricultural sector. Past experience with wide-area disasters has underscored the need for emergency response plans to include tools that will assist decision makers in effectively managing waste from incidents of national significance to minimize threats to human health and the environment.

Research is routinely conducted by the U.S. Environmental Protection Agency's (EPA's) Homeland Security Research Program (HSRP) to provide technical support to EPA and other parts of the federal government for dealing with waste management issues. As part of the HSRP research effort, technical information and tools are developed to help decision makers respond to incidents of national significance. This waste management research program is coordinated through the EPA emergency response community, Department of Homeland Security, other federal agencies, and national laboratories, and with state, tribal, and local government officials, industry, and international research partners. One of the major outputs from this research is EPA's Incident Waste Decision Support Tool (I-WASTE).

1.2 Overview

I-WASTE provides important information to support planning and response decision-making and features calculators to generate waste quantity estimates, provides databases of treatment and disposal facilities, and includes links to technical information, regulations, and guidance to address the safe and efficient removal, transport, treatment and/or disposal of waste materials. The objective of I-WASTE is to help reduce restoration time and expense by providing quick access to information that will inform the decision-making process for incident waste management.

1.3 General Content

For the purpose of this tool, the term “waste management” refers to the entire process of packaging, handling, treating, and transporting the waste until it resides in its final resting place—be it a secure landfill, as recycled/reused materials, or other locations. The terminology used in the tool is contextual. Under normal circumstances, EPA differentiates between “materials” and “wastes” along the waste management continuum^a. The term “waste” used throughout the tool refers to incident-generated wastes, some of which might be materials that can be treated or diverted to recycling if appropriate.

Information was collected from open literature, state and federal regulatory agencies, and landfill and incinerator industry stakeholder groups to develop technical guidance for treatment and disposal of waste resulting from incidents of national significance. Information contained within or accessible through the tool includes:

- An estimator to calculate order-of-magnitude debris/disposal quantities.

^a Waste Management Hierarchy and Homeland Security Incidents, <https://www.epa.gov/homeland-security-waste/waste-management-hierarchy-and-homeland-security-incidents> (last accessed: April 22, 2021).

- A database of treatment and disposal facilities including contact information and geographic location. Treatment and disposal facilities that are provided include combustion facilities (e.g., Hazardous Waste Combustion Facilities, Medical/ Biohazardous Waste Incinerators, Municipal Combustion Facilities), landfills (e.g., Industrial Waste Landfills, Inert or Construction and Demolition Landfills, Municipal Solid Waste Landfills, Resource Conservation and Recovery Act (RCRA) Subtitle C Landfill, RCRA Subtitle C Landfill with Low Activity Waste Authority), recovery facilities (e.g., Construction & Demolition (C&D) Recyclers, Composting, Demolition Contractors, Electronics Recyclers, Household Hazardous Waste Collection, Metal Recyclers, Tire Recyclers, Transfer Stations, Vehicles Recyclers), and other waste management facilities.
- Information about on-site segregation and pre-processing of waste to make the material more suitable for disposal in a given facility.
- Information on packaging to minimize risk to workers handling the waste, the treatment and disposal facility workers, and people along the transportation route to the treatment or disposal facility, and to minimize potential for contaminating the facility.
- Information related to transporting incident-generated waste including links to relevant packaging regulations, guidance on performance requirements for containers, and possible suppliers of hazardous material transport containers.
- Information on characteristics of waste residues formed during the incineration process and requirements for their safe disposal.
- Natural disaster debris/waste characteristics and guidance.
- Radiological/nuclear incident waste information and guidance.
- Chemical and biological contaminant and decontaminant characteristics, and a database of radionuclides.
- Water systems equipment and guidance for disposal of water treatment facility equipment and residues.
- Agricultural incident disposal guidance.
- A library of waste management resources to assist in the decision-making process.

Waste streams that are addressed include waste from the decontamination of buildings, including construction materials as well as building contents (e.g., furniture, ceiling tiles, wall hangings, and carpeting). In the case of natural disasters, there can be significant quantities of waste that are contaminated from damaged chemical and industrial facilities, household hazardous waste, mold, and other pollutants. Cleanup of contaminated water treatment and distribution systems might involve the disposal of pumps, filters, piping, and other equipment. The waste also might include personal protective equipment (PPE) from the cleanup crews, which could be contaminated with residual agents at varying and possibly unknown levels. For agricultural incidents involving animal carcass disposal and animal byproducts, there is a need for quick response times to minimize further impacts, and to reflect EPA's role as a support agency working with the U.S. Department of Agriculture (USDA) as the lead agency.

This report provides a high-level overview of I-WASTE. I-WASTE is a web-based decision support tool developed by EPA to assist all the previously listed decision makers through the process of planning the management of residual materials/waste from incidents of national significance.

This tool was developed in close collaboration with stakeholders representing all the important decision-making entities as part of a larger program to investigate issues related to management of materials from these incidents. Instructions for using I-WASTE and documentation describing the technology architecture is included. The remainder of this report is structured in the following manner:

- Chapter 2 discusses quality assurance/quality control activities;
- Chapter 3 summarizes the history of I-WASTE and its intended uses and applications;
- Chapter 4 summarizes I-WASTE's modernized technology architecture;
- Chapter 5 provides instructions for accessing and navigating I-WASTE;
- Chapter 6 describes the Waste Materials Estimator;
- Chapter 7 describes the Treatment and Disposal Facilities inventory; and
- Chapter 8 describes the Guidance & Information portal.

2 QUALITY ASSURANCE/QUALITY CONTROL

The purpose of this project was to modernize a legacy web-based application to provide continued access to important information to support planning and response decision-making, including calculators to generate waste quantity estimates, databases of treatment and disposal facilities, and links to technical information, regulations, and guidance to address the safe and efficient removal, transport, treatment and/or disposal of waste materials. Software development activities conducted during this project adhere to industry best practices and follow the project-approved quality assurance project plan (QAPP) that addresses requirements for Software and App Development. The security of the application was approved and cleared by EPA's Office of Research and Development's (ORD) Office of Science Information Management (OSIM) and EPA's Office of Mission Support (OMS), and the research and content made available through the application was cleared by ORD's Center for Environmental Solutions and Emergency Response. No scientific experiments were performed. Technical area leads evaluated the quality of application code, related technical documentation, and security controls that were developed during this effort. Separately, the I-WASTE project is governed by a Configuration Management Plan and undergoes monthly auditing.

3 I-WASTE HISTORY AND RESEARCH APPROACH

Work on the first version of I-WASTE began in September of 2003, and the completed version 1.0 of the tool was released in September of 2004. The project was initiated in response to a recommendation developed during the May 2003 Workshop on Transport and Disposal of Wastes from Facilities Contaminated with Chemical or Biological Agents. The workshop was conducted by ORD, and involved 34 participants representing federal and state agencies, the solid waste industry, and chemical/biological agent experts from the U.S. Army. Participants recommended that EPA develop a comprehensive inventory of candidate

combustion/incineration facilities, as well as create a compilation of guidance that would assist those responsible for the disposal of building decontamination residue in selecting the appropriate combustion facility or facilities.

Version 1.0 was developed to address the needs identified by EPA and other stakeholders. Subsequent versions of the tool were incrementally developed over time. Additional features were added to comprise a suite of tools, and each version was built upon existing functionality of the previous version. Content and functionality were developed based on input obtained from stakeholders during workshops, reviews, and focus group meetings. The tool underwent external peer review in August 2011 and version 6.2 (released in April 2012) incorporated revisions to address peer review comments, as well as a new waste estimator for open spaces. The tool was renamed in April 2012 based on recommendations by the external peer reviewers from the former Incident Waste Management Planning & Response Tool (IWMPRT) to I-WASTE.

Prior to the current modernization effort, the last significant update of the tool occurred in December 2016 (v.6.5). Version 6.5 of the tool represented the last iteration of “legacy” I-WASTE and was replaced with the modernized I-WASTE (v.7.0). The legacy website Uniform Resource Locator (URL) will remain in place and redirect all past users to the updated tool.

Modernization of I-WASTE leverages technological advances and incorporates a modern look and feel to the tool. Users will find a familiar overall organization, but within a user interface that provides a more modern user experience. A notable addition to I-WASTE v.7.0 is the availability of an application programming interface (API) and web services that can be used to directly leverage data that is provided by I-WASTE. Emphasizing an API-first approach, this project supports the Agency’s efforts to making APIs the default method for accessing agency data¹. I-WASTE v.7.0 also includes updated facility data and new household hazardous waste streams estimates within the Waste Materials Estimator.

3.1 Design Philosophy and Technical Approach

I-WASTE is referred to as a decision support tool^b and is not an expert system^{c,2}. This distinction guided the development of the tool from the outset. An opaque system that simply “told” the user what to do would: 1) not be trusted, and 2) could not address the immense number of situations and site-specific considerations that could be encountered. The tool is designed to help users make decisions, not tell the user what to do. The tool is also intended to streamline activities by anticipating what information might be useful and making it easy to access that information.

It is important to understand that the information provided within the tool does not override existing regulatory or legal requirements that might apply. Because the tool is not an expert system, the information provided should be used as a starting point for understanding some of

^b Decision Support Tool: Software, analysis methods, models, data sets, maps, etc. available to inform the decision-making.

^c Expert System: A computer program that mimics the judgment of experts.

the options available for disposal of these materials. Final disposal decisions can only be made after contacting the appropriate authorities at local, state, tribal, and regional regulatory offices and coordinating with the waste management facilities, among many other considerations.

In developing the tool, flexible design considerations were emphasized to make the information and tool's processes specific enough to be useful, yet adaptable enough to fit the many possible situations that might result from a chemical or biological attack, an animal disease incident, a natural disaster, or a radiological incident. To that end, there are several places where users will find default values in the tools that can be accepted by the user or changed to fit specific situations. Users are encouraged to adjust default parameters to better reflect incident-specific characteristics. Additionally, in places where the tool presents certain information (e.g., item heat content, residual ash), the assumptions involved are presented so that the user can adjust the results if the assumptions are not valid for the case at hand.

3.2 Stakeholder Involvement

I-WASTE was developed using an iterative approach and in partnership with stakeholders who could advise in the development and review of each version. During active development, workshops were held nominally every six months to obtain feedback on the different features as they were developed. To date, ten stakeholder workshops and four online focus group meetings have been held. Stakeholders attending and providing input into the development of I-WASTE have included representatives from the following organizations:

- U.S. Environmental Protection Agency;
 - Environmental Response Team,
 - Consequence Management Advisory Team,
 - National Homeland Security Research Center,
 - Office of Homeland Security,
 - Office of Radiation and Indoor Air,
 - Office of Resource Conservation and Recovery,
 - Office of Emergency Management,
 - Office of Water,
 - Region 4, and
 - Region 5.
- Other Federal Agencies;
 - Department of Homeland Security,
 - U.S. Department of Agriculture,
 - U.S. Army Corps of Engineers,
 - U.S. Department of Energy,
 - U.S. Department of Transportation,
 - U.S. Department of Homeland Security, Federal Emergency Management Agency, and
 - National Institute of Standards and Technology.

- State/Local Agencies;
 - California Emergency Management Agency,
 - Delaware Solid Waste Authority,
 - District of Columbia Water and Sewer Authority,
 - Fairfax Water,
 - Florida Department of Environmental Protection,
 - Florida Division of Emergency Management,
 - Iowa Department of Natural Resources Emergency Response & Homeland Security,
 - Leesburg, Virginia, Department of Utilities,
 - Massachusetts Department of Environmental Protection,
 - Metropolitan Washington Council of Governments,
 - Michigan Radiological Protection Program,
 - Michigan Department of Environmental Quality,
 - Michigan Department of Natural Resources and Environment,
 - Minnesota Pollution Control Agency,
 - New Jersey Department of Environmental Protection,
 - New York State Department of Environmental Conservation,
 - Ohio Environmental Protection Agency,
 - Pennsylvania Bureau of Radiation Protection,
 - Pennsylvania Department of Environmental Protection,
 - Polk County, Florida,
 - Tennessee Department of Environment and Conservation,
 - Texas Commission on Environmental Quality,
 - Vermont Agency of Natural Resources/Solid Waste Management Program, and
 - Washington Department of Health.
- Waste and Water Industry Groups; and
 - American Water Works Association,
 - Association of Metropolitan Water Agencies,
 - Association of State Drinking Water Administrators,
 - Association of State and Territorial Solid Waste Management Officials,
 - Coalition for Responsible Waste Incineration,
 - Covanta Energy,
 - Integrated Waste Services Association,
 - National Association of Clean Water Agencies,
 - National Solid Waste Management Association,
 - Solid Waste Association of North America, and
 - Waste Management, Inc.
- Educational Institutions, National Laboratories, and Professional Organizations.
 - Argonne National Laboratory,
 - Concurrent Technologies Corporation,

- Conference of Radiation Control Program Directors,
- CSC Biology Studies Group,
- Dewberry,
- Johns Hopkins Applied Physics Laboratory, and
- University of Florida.

3.3 Outreach

Presentations and demonstrations of I-WASTE have been presented at the following meetings/conferences:

- November 2019: Presentation at EPA's 2019 International Decontamination Research and Development Conference, Norfolk, VA.
- March 2019: WM2019 Conference, Phoenix, AZ.
- March 2019: 2019 National Association of County and City Health Officials' Preparedness Summit, St. Louis, MO.
- November 2017: EPA Vehicle Disposal Workshop, Arlington, VA.
- 2015: Poster at ORD Tools Café, Narragansett, RI.
- 2015: Presentation at the Association of State and Territorial Solid Waste Management Officials' Annual Meeting, Bethesda, MD.
- 2015: Presentation at EPA's the Consequence Management Advisory Division's Scientific Support Coordinator Training, Research Triangle Park, NC.
- 2016: Presentation for EPA Tools and Resources Webinar.
- 2016: Presentation for the Air & Waste Management Association's Annual Meeting, New Orleans, LA.
- 2014: Presentation for White House Innovation for Disaster Response and Recovery Initiative Demo Day, Washington, DC.
- 2013: Presentation at EPA's 2013 Research and Development Decontamination Conference, Research Triangle Park, NC.
- 2013: EPA Homeland Security Waste Management Tools Presentation for Technical Coordination Working Subgroup on Systems Modeling and Risk Assessment.
- 2013: Webinar Presentation at PeerOvation Workshop.
- October 2009: U.S. Department of Homeland Security (DHS) Chemical Operational Technology Demonstration Final Demonstration, Ontario, CA.
- October 2009: Twelfth International Waste Management and Landfill Symposium, Cagliari, Italy.
- July 2009: Third International Symposium Management of Animal Carcasses, Tissue, and Related Byproducts, Davis, CA.
- March 2009: Presentation to Association of State and Territorial Solid Waste Management Officials' Radiation Focus Group, Washington, DC.
- March 2009: WM2009 Conference, Phoenix, AZ.
- November 2008: U.S. Conference of Mayors' Municipal Waste Management Association 2008 Fall Summit, San Diego, CA.
- September 2008: Global Waste Management Symposium, Copper Mountain, CO.

- February 2008: WM2008 Conference, Phoenix, AZ.
- October 2007: WasteCon 2007, Reno, NV.
- October 2007: Sardinia 2007, Eleventh International Waste Management and Landfill Symposium, Cagliari, Italy.
- September 2007: CHEM Restoration U.S. Department of Energy (DOE)/ Operational Technology Demonstration (OTD) Workshop, Los Angeles, CA.
- May 2007: WasteExpo 2007, Atlanta, GA.
- March 2007: Workshop on Waste Management Options in Natural Disasters, Baton Rouge, LA.
- February 2007: 2007 On-Scene Coordinator (OSC) Readiness Training, Miami, FL.
- December 2006: National Carcass Disposal Symposium, Beltsville, MD.
- July 2006: 2006 OSC Readiness Training Program, Los Angeles, CA.
- June 2006: 99th Annual Air & Waste Management Association Conference, New Orleans, LA.
- January 2006: 2006 Waste Management National Meeting, Washington, DC.
- March 2005: Homeland Security Workshop on Transport, Treatment, and Disposal of Solid Wastes Contaminated with Chemical or Biological Agents, Washington, DC.
- June 2004: Integrated Waste Services Association (IWSA) Health & Safety Seminar, Washington, DC.
- April 2004: EPA Safe Buildings Disposal Program's Stakeholder Meeting Hosted by the Integrated Waste Services Association, Washington, DC.

Ten stakeholder workshops and four online focus group meetings were held following early releases of the tool to demonstrate the tool's latest enhancements and obtain important feedback to refine the overall design:

- June 2010 (Version 6.0).
- January 13, 2010 – Online On-Scene Coordinator Focus Group Meeting.
- December 10, 2009 – Online Combined Focus Group Meeting.
- July 30, 2009 – Online Radiological Focus Group Meeting.
- May 27, 2009 – Online Planner Focus Group Meeting.
- August 20, 2008 (Version 5.0).
- November 20, 2007 (Version 4.2).
- April 2007 (Version 4.1).
- February 21, 2007 (Version 4.1 – Water Modules).
- July 18, 2006 (Version 4.0).
- July 25, 2006 (Version 4.0 – Water Modules).
- January 5, 2006 (Version 2.1 – Water Modules).
- November 8-9, 2005 (Version 2.1).
- June 2, 2005 (Version 2.0).

3.4 Uses and Application

I-WASTE has been used in responding to events of local, regional, or national significance, including hurricanes, floods, and wildfires. In addition, in February 2006, the tool was used to obtain information to manage debris from the cleanup of anthrax contamination at a New York City residence and again in 2007 as a result of an anthrax contamination event in Connecticut.

Most I-WASTE applications thus far have been part of planning exercises as required in the National Response Framework¹ for regional and local authorities to design exercises and waste management plans for exercise scenarios or real-world incidents. Example applications in planning include use in developing disaster debris plans. In another instance, I-WASTE was used to develop estimated remediation costs for the Houston Airport involving a hazardous substances-related event in an airport terminal. The tool has also been used to conduct capacity analysis as part of an agricultural waste planning exercise by EPA's Office of Solid Waste and Emergency Response. Finally, the tool has been used in several DHS "tabletop" exercises for generating estimates of waste materials and identifying potential waste management facilities. These exercises occurred in April 2005 for a scenario based on a hypothetical mustard gas attack in New London, Connecticut, and in April 2010 in the Liberty RadEx National Level Exercise³. The tool has also been used in the DHS Airport Biological and Chemical Operational Technology Demonstration (OTD)⁴ planning exercises centered on the Los Angeles International Airport, as well as DHS's Interagency Biological Restoration Demonstration (IBRD) Program⁵. I-WASTE was also used in support of the Wide Area Recovery and Resiliency Program (WARRP)⁶ in the development of a decontamination selection decision support tool and in the development of waste estimates for chemical, biological, and radiological incidents based on WARRP scenarios. In 2011, I-WASTE was used during the DHS-sponsored interagency field exercise as part of the Bio-Response Operational Testing and Evaluation (BOTE) project⁷. In addition, several EPA On-Scene Coordinators have used the tool as part of planning exercises. I-WASTE is currently being incorporated as a resource in a tool being developed by EPA's Office of Resource Conservation and Recovery (ORCR) and Office of Homeland Security (OHS) to support state and local agencies developing waste management plans in anticipation of wide-area all-hazards incidents. I-WASTE is also included in guidance for agricultural emergency response that was developed by the USDA and DHS.

4 I-WASTE INFORMATION ARCHITECTURE

I-WASTE's information architecture solution is built upon a cloud-based, open-source technology stack to leverage a modern framework that enables rapid development and deployment and optimal performance. The application-level architecture of I-WASTE is described in the sections that follow.

4.1 Application-Level Architecture

I-WASTE consists of the following system components:

- **Front-End** – The front-end component powers the user experience. It provides the interface for the user to allow interaction with all the pages, data, and document access. The front-end also utilizes a subset of the data that drives the application and supports several operational and navigational features. The front-end presentation component generally consists of Hypertext Markup Language (HTML) 5, Cascading Style Sheet (CSS)/syntactically awesome style sheets (Sass), JavaScript, and API web services consumption. I-WASTE uses Vue.js^d as its user interface framework. The application utilizes the OneEPA template and integrates user interface components from the U.S. Web Design System^e.
- **Back-End and Server-Side Programming** – The back-end powers the website and consists of web servers, databases, and the server-side programming components and business logic. The back-end component provides web services to supply data to the front-end, as needed, based on user actions. Back-end data are stored in a MySQL database, and server-side programming prepares blocks of data by way of web services. Server-side programming in the middle-tier is implemented using Hypertext Preprocessor (PHP) (Laravel^f framework). Data are delivered using a representational state transfer (or RESTful) API in JavaScript Object Notation (JSON) format for consumption by the front-end for display to the user. The database schema is maintained in version control using Laravel migrations, enabling consistency across environments and a recorded history of schema updates.
- **Hosting Environment** – I-WASTE is currently deployed in the General Services Administration (GSA) cloud.gov environment. I-WASTE resides within an EPA/ORD cloud.gov organization space and uses the standard cloud.gov provided PHP build pack to support deployments. The cloud.gov environment offers a few noteworthy features to improve the deployment process and increase website stability, including:
 - Dynamic Scalability – If the application receives a large uptick in users or data processing, the hosting platform can instantly scale to handle increased load.
 - Automated Build Processes – Developers can create automated processes that are triggered as code is updated. A set of steps (e.g., tests, code bundling, code deployment) can be automatically run.
 - Self-service Provisioning and Deployment – Developers can directly provision services (e.g., increasing resources) and deploy applications.

I-WASTE application source code is available in a public [EPA GitHub repository](#).

^d Vue.js, <https://vuejs.org/>

^e U.S. Web Design System, version 2.11.1, <https://designsystem.digital.gov/> (last accessed 14 April 2021).

^f Laravel, <https://laravel.com/>

Figure 1 below illustrates I-WASTE’s application-level architecture. Data and information included in I-WASTE can be searched and retrieved by any public user with a connected internet browser.

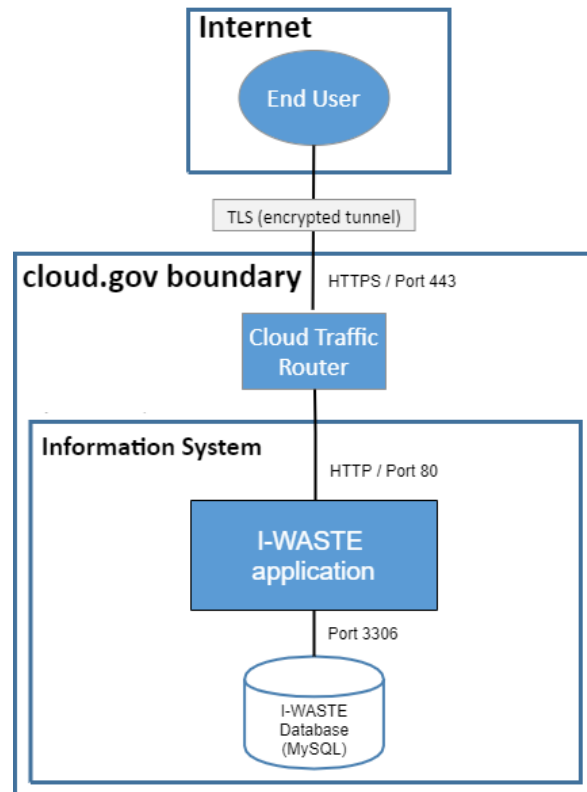


Figure 1. I-WASTE information architecture.

5 ACCESSING I-WASTE

I-WASTE’s features are available to any user who accesses the application at <https://iwaste.epa.gov>. Figure 2 presents the I-WASTE home page from which all the functionality described in the following sections can be accessed.

Incident Waste Decision Support Tool (I-WASTE DST)

Planners, emergency responders, and other individuals responsible for making disposal decisions can access technical information, regulations, and guidance to work through important disposal issues to assure safe and efficient removal, transport, treatment, and/or disposal of debris and waste materials.

Using the options below, quickly produce an order of magnitude waste estimate, access the treatment and disposal facility database, navigate through applicable guidance and information presented in a logical framework, and/or explore other related guidance information.



Waste Materials Estimator

Calculate an order of magnitude estimate for the weight and volume of materials that may require disposal.



Treatment & Disposal Facilities

Search for potential treatment and disposal facilities using geographic and waste acceptance filters.



Guidance & Information

View guidance and information compiled to assist with disposal decisions.

Figure 2. I-WASTE home page.

5.1 Primary Tool Navigation

The I-WASTE home page presents the three key features of the tool:

1. **Waste Materials Estimator** – Users can produce an order-of-magnitude estimate for the weight and volume of materials that might require disposal.
2. **Treatment & Disposal Facilities** – Users can choose one or more filter criteria to generate a list of treatment and disposal facilities.
3. **Guidance & Information** – Users can access guidance and information compiled to assist with disposal decisions.

The three primary features of the tool can be accessed via the corresponding buttons on the home page. Figure 3 presents an overview of the content organization.

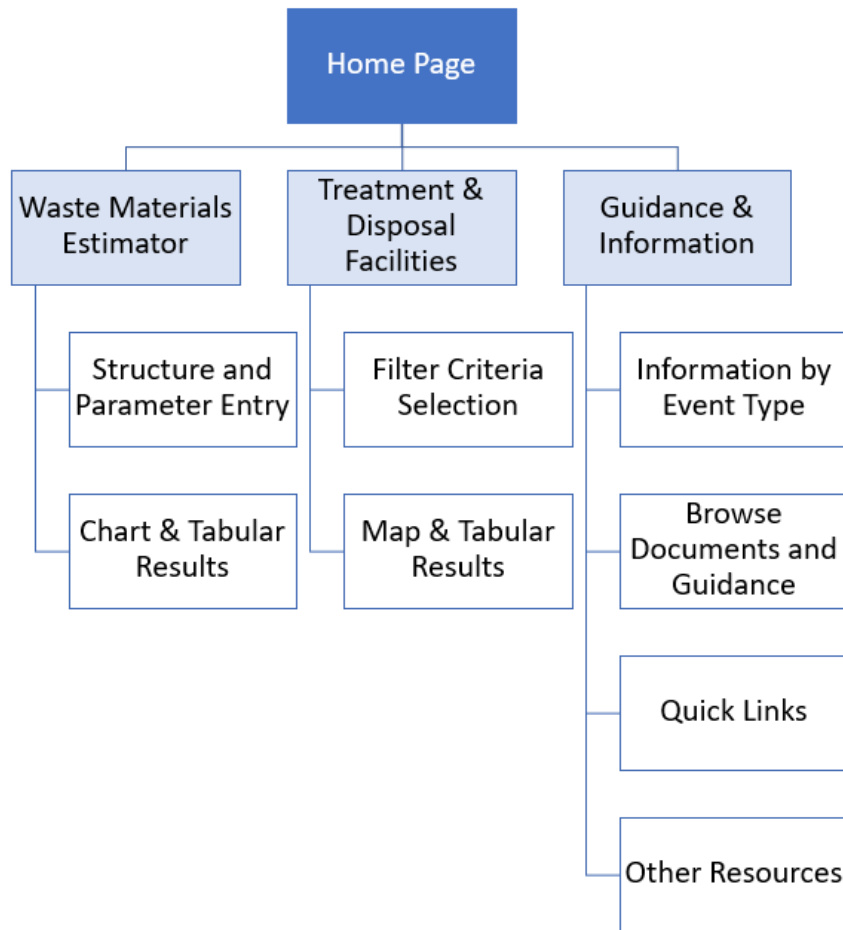


Figure 3. Accessing I-WASTE functionality.

In addition, several utility links are available that provide access to the following resources:

- **I-WASTE Page Title** – Directs users back to the home page from anywhere in the tool.
- **Developers** – Provides access to I-WASTE’s API documentation to support developers directly leveraging I-WASTE’s API to share data with other applications. With this feature, users can directly access data stored in I-WASTE using public web services for use in their applications. I-WASTE provides a collection of “GET” or query-only RESTlike services, available through a simple URL Hypertext Transfer Protocol (HTTP) link, and provides output in JSON format.
- **Help** – Provides access to an overview of tool functionality, including a link to a complete sitemap.
- **Contact Us** – Provides contact information and the ability to send questions or comments to EPA.

5.2 Secondary Tool Navigation

As shown in Figure 4, additional navigation is provided on all secondary pages using a condensed version of the home page where three primary “tabs” are accessible from the top of every page. This provides one-click access to any of the three key features of the tool from anywhere within the tool.



Figure 4. I-WASTE secondary page navigation.

6 WASTE MATERIALS ESTIMATOR

Note: Please refer to the Waste Materials Estimator (WME) Technical Documentation⁸ for a more detailed description of the methodology used to create gross estimates for offices, open spaces, schools, hospitals, hotels, movie theaters, shopping malls, and residences. The user interface for the waste materials estimator is described below.

The Waste Materials Estimator produces an order-of-magnitude estimate for the weight and volume of materials/waste that would require management following an incident. Estimates are based on default values contained in the tool, or users can refine estimates based on more specific user-defined values. The WME generates these estimates utilizing factors that were developed for various types of structures and requires minimal user input. Users can access this feature by clicking the **Waste Materials Estimator** button from the tool home page. Several typical structure types are available for the user to select, including:

- Offices (individual-walled and cubicle arrangement);
- Open spaces;
- Schools (elementary, middle, and high);
- Hospitals;
- Hotels;

- Movie theaters;
- Single-family residences; and
- Shopping malls.

Additionally, users can generate estimates for a single structure type, multiple structures of the same type, or for a combination of structure types (e.g., an elementary school and an office building). Two options for generating estimates are available using either: (1) default parameter values, or (2) user-specified parameter values. Users choosing to generate estimates using default parameters simply specify the number and type of structures that will form the basis of the estimate. Users who wish to modify the parameters are asked to input basic information regarding the structures, such as square footage, number of students, or some other parameter appropriate for that structure type and for which estimation factors were developed. If users choose not to modify the default parameter values, then estimates based on the defaults can be generated quickly in one step.

Multiple WMEs can be combined to generate waste estimates for structure types not explicitly included in the tool. For example, for the DHS Chemical OTD activities, the waste profile for an airport terminal was generated using a combination of the office and shopping mall WMEs, and then supplemented by individual items from the item databases. The resulting inventories were exported to Excel and combined. The sections that follow provide instructions for using the WME.

6.1 Waste Materials Estimator Page

After selecting **Waste Materials Estimator** from the tool home page, users are presented with the Waste Materials Estimator page shown in Figure 5. On this page, users can specify the quantity of each structure type included in the estimate. Users can click the hyperlinked structure type to access a description of the structure type and a description of how it is represented in the estimator. Additional guidance is accessible within the More Information box that provides details on the various data, assumptions, and calculations used by the estimator. Guidance is also provided that briefly outlines the differences between the Waste Materials Estimator and Federal Emergency Management Agency's (FEMA's) Hazards U.S.-Multi-Hazard (HAZUS-MH) Loss Estimation Software program⁹, a freely available loss estimation software package that uses geospatial data and census information to estimate debris from natural disasters.

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Incident Waste Decision Support Tool (I-WASTE DST)

Waste Materials Estimator

Treatment & Disposal Facilities

Guidance & Information

Waste Materials Estimator

Use the Waste Materials Estimator to generate order of magnitude estimates for the types and quantities of materials that may require decontamination and/or disposal from one or more structure types. Base your estimates on default parameter values or modify parameters with user-defined values.

More Information

- [Default Parameter Values for Structures](#)
- [Modeling Other Structure Types](#)
- [Non-Structural/Interior Waste Materials](#)
- [Structural Waste Materials](#)
- [Waste Materials Estimator and HAZUS-MH](#)

Waste Materials Estimator results represent an order-of-magnitude estimate based on limited data and information and should be considered as a reasoned judgment and not a precise estimate. The difference between the estimated mass and volume of items and materials and actual values will vary considerably, given the wide range of building designs and layouts, even within a single building type addressed by the tool (e.g., hotels, hospitals, schools, etc.).


Specify Structure Quantities & Parameters

Open Space	Total affected area (square miles):	<input type="text"/>
Movie Theaters	Qty:	<input type="text"/>
Single-Family Residences	Qty:	<input type="text" value="150"/>
+ Hospitals		
+ Hotels		
+ Offices		
+ Schools		
+ Shopping Malls		


Clear
Generate Estimates

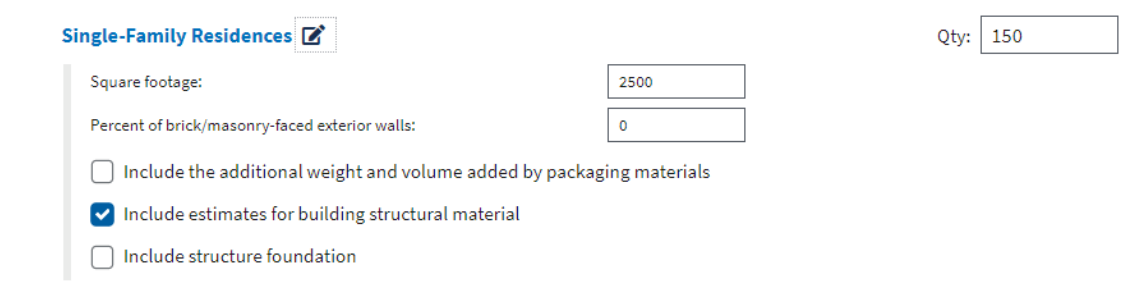
Figure 5. Waste Materials Estimator page.

After specifying the quantities of one or more structure types to include in an estimate, users can choose to generate estimates directly using the default parameters for each structure type, or users can view or modify the default parameters to refine their estimates. Clicking the

Generate Estimates button will run the calculations and present results described in more detail below (see Section 6.3). Alternatively, clicking the “editing pencil” icon  will expand the view to allow users to edit default parameter values for a given structure type (see Section 6.2). A **Clear** button is available to clear entries previously made if users wish to start over.

6.2 Parameter Values

Users that choose to view and/or modify the default parameters are presented with an expanded view as shown in Figure 6. Users can view and/or modify the default parameters for each of the structure types specified on the Waste Materials Estimator page. Users can click on the “editing pencil” icon  to view or modify values for the parameters associated with each structure type that was selected. The default parameter values are pre-populated for each structure type.



The screenshot shows a web form for 'Single-Family Residences'. At the top left is the title 'Single-Family Residences' with a pencil icon. To the right is a 'Qty:' label followed by a text box containing '150'. Below the title are three input fields: 'Square footage:' with a value of '2500', 'Percent of brick/masonry-faced exterior walls:' with a value of '0', and three checkboxes. The first checkbox is 'Include the additional weight and volume added by packaging materials' and is unchecked. The second checkbox is 'Include estimates for building structural material' and is checked. The third checkbox is 'Include structure foundation' and is unchecked.

Figure 6. Parameter values example.



For each structure type, the default parameters can be modified, and additional options can be selected to generate estimates for each category. By default, all waste estimates include building structural materials. Users can review details about the input parameters required to generate the associated estimate by clicking one of the relevant links in the More Information box located on each tab.

Users can click the **Generate Estimates** button to view the results of calculations for gross weight, volume, and combined total for each waste category grouping.

6.3 Estimated Waste Materials

The Waste Materials Estimator page expands to show the “View Waste Stream Quantity Distributions” section that presents a chart and tabular view of the estimated waste materials. Results displayed represent an order-of-magnitude estimate based on limited data and information and should be considered as a reasoned judgment and not a precise estimate. The difference between the estimated mass and volume of items and materials and actual values will vary considerably, given the wide range of building designs and layouts, even within a single building type addressed by the tool (e.g., hotels, hospitals, schools). Figure 7 and Figure 8

illustrate an example based on the structure type(s) selected and the parameters used (whether default or user-modified). Estimates are divided into several categories depending on the structure type(s) that were selected (and whether users chose to modify the default parameters). Waste/materials categories that are applicable to more than one structure type are aggregated as necessary, whereby only one summary row exists for each waste/materials category. Cautionary language that explains the magnitude of error that might be associated with the gross estimate is included at the top of the page. The specified criteria on which the estimates are based can be viewed by clicking the **+ Show more** link.

Users can view the details and assumptions associated with each category by clicking the hyperlinked waste category name on the left side of the results table. In addition, functionality to export the tabular data presented to print or save outside the tool is available. Users can click the “Download” icon  link to save results. Waste estimate results generated are also available in JSON format. Users can click the “API” icon  link to access additional details.

Waste Materials Estimator

Use the Waste Materials Estimator to generate order of magnitude estimates for the types and quantities of materials that may require decontamination and/or disposal from one or more structure types. Base your estimates on default parameter values or modify parameters with user-defined values.

More Information

- [Default Parameter Values for Structures](#)
- [Modeling Other Structure Types](#)
- [Non-Structural/Interior Waste Materials](#)
- [Structural Waste Materials](#)
- [Waste Materials Estimator and HAZUS-MH](#)

Specify Structure Quantities & Parameters +

View Waste/Material Stream Quantity Distributions —

Estimate Criteria: Single-Family Residence (150) + Show more

 **Make a New Estimate**

 **API**  **Download**

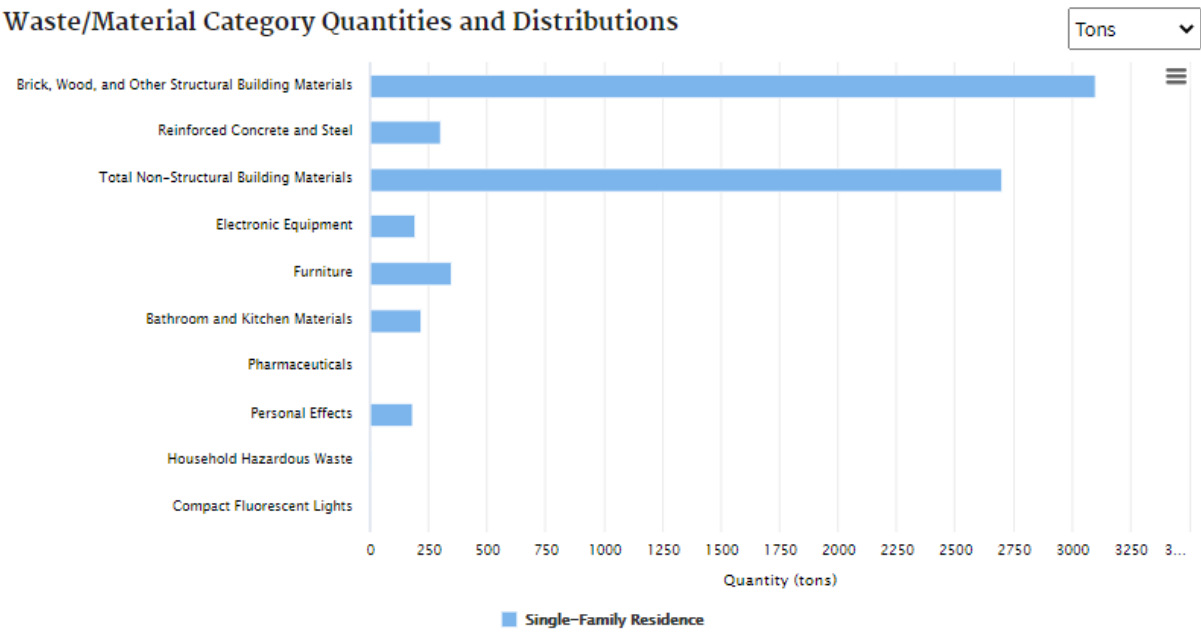


Figure 7. Waste Materials Estimator results page – chart.

Waste/Material Category	Waste/Material Quantities	
	Tons	Cubic Yards
Structural		
Brick, Wood, and Other Structural Building Materials	3,100	7,800
Reinforced Concrete and Steel	300	330
Interior/Non-Structural		
Total Non-Structural Building Materials	2,700	17,000
Drywall	1,800	5,100
Carpet	98	750
Wood	140	300
Other Non-Structural Building Materials	730	11,000
Electronic Equipment	190	2,200
Furniture	350	5,600
Bathroom and Kitchen Materials	220	2,300
Pharmaceuticals	0.068	0.56
Personal Effects	180	2,300
Household Hazardous Waste	5.2	7.6
Oil & Latex Paint	2.8	2.5
Used Oil	0.85	1.4
Lab Packed Aerosols	0.12	0.15
Flammable Liquids	0.24	0.26
Bulk Fuels	0.44	0.55
Flammable Solids	0.029	0.0098
Pesticides	0.05	0.056
Poisons	0.24	0.29
Antifreeze	0.087	0.092
Batteries	0.21	2.3
Other Corrosives	0.082	0.056
Cleaning Supplies	0.00059	0.0035
Compact Fluorescent Lights	0.12	0.39
Totals	7,100	38,000

Figure 8. Waste Materials Estimator results page – table.

Users have the option to revise the current estimate by revisiting the “Specify Structure Quantities & Parameters” section of the page or start a new estimate by clicking the **Make a New Estimate** button. If users choose to revise their estimates, the previous entries made are retained, including any modifications made to default parameters for each structure. Clicking the **Make a New Estimate** button clears out any previous entries.

Tables 1 through 3 present the waste/materials categories for hospitals, hotels, offices, open spaces, residences, schools, shopping malls, and movie theaters.

Table 1. Waste/Materials Categories for Hospitals and Hotels

Hospital Categories	Hotel Categories
<u>Structural Materials</u> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <u>Interior/Non-Structural Materials</u> Total Non-Structural Building Materials – Drywall – Ceiling Tiles – Carpet – Other Non-Structural Building Materials Electronic Equipment – Patient Care Equipment – Imaging Equipment – Laboratory/Surgery Equipment – Industrial Electronic Equipment – Other Electronic Equipment Furniture – Office and Other Furniture – Patient Care Furniture Medical Supplies Pharmaceuticals Linens Food Paper and Office Supplies Medical Waste Other Items and Equipment	<u>Structural Materials</u> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <u>Interior/Non-Structural Materials</u> Total Non-Structural Building Materials – Drywall – Ceiling Tiles – Carpet – Marble and Ceramic Tiles – Other Non-Structural Building Materials Electronic Equipment – Industrial Electronic Equipment – Other Electronic Equipment Furniture Paper and Office Supplies Food Linens Dishware Personal Effects Other Items and Equipment

Table 2. Waste/Materials Categories for Offices, Open Spaces, Residences, and Schools

Office Categories	Open Space Categories
<p><u>Structural Materials</u></p> <ul style="list-style-type: none"> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <p><u>Interior/Non-Structural Materials</u></p> <p>Total Non-Structural Building Materials</p> <ul style="list-style-type: none"> – Drywall – Ceiling Tiles – Carpet – Other Non-Structural Building Materials <p>Electronic Equipment</p> <p>Furniture</p> <p>Paper and Office Supplies</p>	<p>Soil</p> <p>Vegetation</p> <p>Asphalt</p> <p>Concrete</p>
Residence Categories	School Categories
<p><u>Structural Materials</u></p> <ul style="list-style-type: none"> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <p><u>Interior/Non-Structural Materials</u></p> <p>Total Non-Structural Building Materials</p> <ul style="list-style-type: none"> – Drywall – Carpet – Wood – Other Non-Structural Building Materials <p>Electronic Equipment</p> <p>Furniture</p> <p>Bathroom and Kitchen Materials</p> <p>Pharmaceuticals</p> <p>Personal Effects</p> <p>Household Hazardous Waste</p> <ul style="list-style-type: none"> – Oil and Latex Paint – Used Oil – Lab Packed Aerosols – Flammable Liquids – Bulk Fuels – Flammable Solids – Pesticides – Poisons – Antifreeze – Batteries – Other Corrosives – Cleaning Supplies <p>Compact Fluorescent Lights</p>	<p><u>Structural Materials</u></p> <ul style="list-style-type: none"> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <p><u>Interior/Non-Structural Materials</u></p> <p>Total Non-Structural Building Materials</p> <ul style="list-style-type: none"> – Drywall – Ceiling Tiles – Carpet – Wood Flooring – Other Non-Structural Building Materials <p>Electronic Equipment</p> <ul style="list-style-type: none"> – Industrial Electronic Equipment – Other Electronic Equipment <p>Furniture</p> <p>Paper and Office Supplies</p> <p>Gym and Sports Equipment</p> <p>Art and Music Equipment</p>

Table 3. Waste/Materials Categories Movie Theater and Shopping Malls

Movie Theater Categories	Shopping Mall Categories
<u>Structural Materials</u> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <u>Interior/Non-Structural Materials</u> Total Non-Structural Building Materials – Drywall – Ceiling Tiles – Carpet – Curtains and Acoustical Material – Other Non-Structural Building Materials Electronic Equipment – Concession Electronic Equipment – Theater Electronic Equipment – Other Electronic Equipment Furniture Food Other Items and Equipment	<u>Structural Materials</u> – Brick, Wood, and Other Structural Building Materials – Reinforced Concrete and Steel <u>Interior/Non-Structural Materials</u> Total Non-Structural Building Materials – Drywall – Ceiling Tiles – Carpet – Marble and Ceramic Tiles – Other Non-Structural Building Materials Electronic Equipment – Industrial Electronic Equipment – Other Electronic Equipment Furniture – Office and Other Furniture – Retail Furniture Paper and Office Supplies Food Linens Other Items and Equipment

Several other factors might affect the amount of materials requiring disposal. These factors are considered when generating an estimate based on a user’s selections. Additional factors considered can include:

- Building structural materials (all structure types);
- Additional weight and volume added by packaging materials;
- Removal of paper and office supplies from furniture prior to shipment and disposal (for offices and schools);
- Material in common areas (shopping malls);
- Whether the hotel is luxurious, containing extensive marble/decorations (hotels only); and
- Whether to include only materials in patient care areas (hospitals only).

7 TREATMENT & DISPOSAL FACILITIES

Access to an inventory of treatment and disposal facilities is available within the tool. Contact information, location, and other technical information is available for the following categories of facilities:

- Landfill Facilities;
- Combustion Facilities;
- Recovery Facilities;
- Wastewater Treatment Facilities;
- Other Facilities; and
- Government-Owned Land/Facilities.

It is important to note that the facilities presented in the tool are not endorsed by EPA, nor have any facility owners agreed to accept any material. Facility location and contact information is provided to facilitate the initiation of treatment and disposal discussions.


Selecting **Treatment & Disposal Facilities** from the home page will present the search page. As shown in Figure 9, the following filter criteria are available to refine user search results:


- Facility Type;
- State; and
- EPA Region.


Users can choose one or more filter criteria. To view all facilities, users would leave the selection boxes blank. Clicking the **View Facilities** button will generate a list of facilities that meet all the specified criteria. Users can click **Clear** to clear previously selected filter criteria and start over.

[Developers](#) [Help](#) [Contact Us](#)

Incident Waste Decision Support Tool (I-WASTE DST)

 Waste Materials Estimator

 Treatment & Disposal Facilities


 Guidance & Information

Treatment & Disposal Facilities

Search for treatment and disposal facilities using the filters below. Click View Facilities to generate a list of facilities that meet all of the specified criteria.

More Information

- [Universe of Facilities](#)
- [Questions for Facility Contacts](#)

 The facilities presented in the tool are not endorsed by EPA, nor have any facility owners agreed to accept any material. A facility's ability to accept incident waste is case specific and determined by the facility and its regulators. Facility contact information is provided to facilitate the initiation of treatment and disposal discussions.

Filter Facilities

Facility Type

Select a facility type

State

Select a state

EPA Region

Select an EPA region

Clear

View Facilities

Figure 9. Treatment & Disposal Facilities page.

As shown in Figure 10, facilities will be displayed on a map and presented in tabular format. Tabular results are paginated by 100 records at a time. The facility name, location, and contact information are displayed, if available. The facility name is hyperlinked to a detailed facility page that opens in a new tab that presents additional information.

Users can interact with the map using familiar controls such as zooming in/out, enabling/disabling clustering, and viewing the legend. Similarly, common table controls can be used to scroll, sort, and paginate through results. Where available, a link to the facility's EPA Enforcement and Compliance History Online (ECHO) ¹⁰ Detailed Facility Report is provided by a hyperlinked Source ID.

Facility data can be downloaded or printed for future reference by clicking the corresponding icon links. Additionally, facility data are available via an API for direct use in other applications.

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More Information

- [Universe of Facilities](#)
- [Questions for Facility Contacts](#)

+

—

[Submit a facility data correction](#)

Print API Download



Figure 10. Facility search results page.

Information describing the sources and methodologies used to compile the facility databases is provided in the sections below.

7.1 Landfill Facilities

The following types of landfills are included in the tool:

- Industrial Waste Landfills;
- Inert or Construction and Demolition Landfills;
- Municipal Solid Waste (MSW) Landfills;
- RCRA Subtitle C Landfills; and
- RCRA Subtitle C Landfills with Low Activity Radioactive Waste Disposal Authority.

7.1.1 Industrial Waste Landfills

Industrial waste landfill facilities were obtained from EPA's publicly available Facility Level Information on Greenhouse gases Tool (FLIGHT)¹¹. Version 7.0 of I-WASTE includes 184 industrial waste landfill facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.1.2 Inert or Construction and Demolition (C&D) Landfills

Active C&D landfill facilities were obtained from EPA's publicly available Disaster Debris Recovery Tool (DDRT)¹². Version 7.0 of I-WASTE includes 1,495 C&D landfill facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.1.3 Municipal Solid Waste (MSW) Landfills

Active, permitted MSW landfill facilities were obtained from EPA's DDRT. Version 7.0 of I-WASTE includes 1,997 MSW landfill facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.1.4 Resource Conservation and Recovery Act (RCRA) Subtitle C Hazardous Waste Landfills

Active, permitted RCRA Subtitle C landfills were obtained from EPA's DDRT. Version 7.0 of I-WASTE includes 54 RCRA Subtitle C landfill facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.1.5 RCRA Subtitle C Landfills with Low Activity Radioactive Waste Disposal Authority

RCRA Subtitle C landfills that have disposal authority for Low Activity Radioactive Waste are also identified and listed in I-WASTE. Information on these facilities was compiled from a report issued by the U.S. Nuclear Regulatory Commission Advisory Committee on Nuclear Materials & Waste, dated April 30, 2008, and titled "Advisory Committee on Nuclear Waste and Materials

Low-Activity Radioactive Waste Working Group Meeting of February 13-14, 2008.” Version 7.0 of I-WASTE contains 11 RCRA Subtitle C landfills with Low Activity Radioactive Waste disposal authority. Data presented in I-WASTE were last refreshed from the source in 2015.

7.2 Combustion Facilities

The following types of combustion facilities are included in the tool:

- Hazardous Waste Combustion Facilities;
- Medical/Biohazardous Waste Incinerators; and
- Municipal Combustion Facilities.

7.2.1 Hazardous Waste Combustion Facilities

Hazardous waste combustion facilities were obtained from EPA’s publicly available ECHO application¹³. ECHO was queried for active facilities subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) Maximum Achievable Control Technology (MACT) Subpart EEE - Hazardous Waste Combustors. Version 7.0 of I-WASTE includes 121 hazardous waste combustion facilities. Where available, a link to the facility's ECHO Detailed Facility Report is provided. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.2.2 Medical/ Biohazardous Waste Incinerators

The original database of Medical/Biohazardous Waste Incinerators facilities was compiled from an EPA inventory of Hazardous Medical Infectious Waste Incinerators (HMIWI) created in April 2004. The database of facilities was updated in 2009 based on a newer 2008 version of the internal EPA HMIWI inventory and updated again in 2012 to exclude inactive facilities. The list of facilities was updated again in 2015 based on 2013 EPA data on the inventory of HMIWI facilities potentially covered by the final section 111(d)/129 Federal Plan. Hospital-based incinerator facilities were originally not included in I-WASTE but are now included because of potential considerations for Ebola-related wastes. Note, however, these incinerators are typically small, and they might not be approved (or able) to accept Ebola-related waste other than that which is generated by that hospital. Version 7.0 of I-WASTE includes 25 medical/biohazardous waste incinerator facilities. Data presented in I-WASTE were last refreshed from the source in 2015.

7.2.3 Municipal Combustion Facilities

MSW combustion facilities were obtained from EPA’s publicly available FLIGHT. Version 7.0 of I-WASTE includes 71 MSW combustion facilities. Where available, a link to the facility's Detailed Facility Report from the ECHO application is provided. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3 Recovery Facilities

The following types of recovery facilities are included in the tool:

- C&D Recyclers;
- Composting;
- Demolition Contractors;
- Electronics Recyclers;
- Household Hazardous Waste Collection;
- Metal Recyclers;
- Tire Recyclers;
- Transfer Stations; and
- Vehicle Recyclers.

7.3.1 Construction and Demolition (C&D) Recyclers

C&D recyclers include facilities that process C&D materials for recycling/reuse. C&D debris is generated during construction, renovation, and demolition of buildings, roads, and bridges. It is also generated during natural and man-made disasters. Materials accepted might include but are not limited to concrete, wood, metals, glass, and salvaged building components. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 2,435 C&D recycling facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.2 Composting

Composting facilities include active, permitted facilities that process organic waste for composting. Materials that might be accepted include but are not limited to: yard waste, such as fallen leaves, grass clippings, weeds, and other plants, limbs or trunks of trees and other woody plants; pre- or post-consumer food waste; and manure. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 2,824 composting facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.3 Demolition Contractors

Demolition contractors include companies that provided standard demolition services. Contractors listed might also provide a range of demolition-related services including deconstruction. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 2,046 demolition contractors. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.4 Electronics Recyclers

Electronics recyclers include active, permitted facilities that process electronic materials for recycling. Items that might be accepted include but are not limited to cell phones, televisions, computers, batteries, printers, scanners, telecom equipment, copiers, and gaming systems. Many electronic devices contain materials and substances that are toxic and must be kept out of the main waste stream. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 1,824 electronic recycling facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.5 Household Hazardous Waste Collection

Household hazardous waste collection facilities collect household hazardous waste materials for recycling. Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered household hazardous waste. Items that might be accepted include but are not limited to paints, oils, solvents, batteries, pesticides, and cleaners. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 934 household hazardous waste collection facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.6 Metal Recyclers

Metal recyclers are facilities that process metals for recycling (e.g., aluminum, steel, copper, lead, zinc, and auto scrap). These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 4,698 metal recycling facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.7 Tire Recyclers

Tire recyclers are facilities that process used tires for recycling. Tires from automobiles, bicycles, tractors, and other equipment can be recycled. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 1,652 tire recycling facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.8 Transfer Stations

Transfer stations include active, permitted facilities available to store waste temporarily. These facilities were obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 4,387 transfer stations. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.3.9 Vehicle Recyclers

Vehicle recyclers include facilities that accept used vehicle and/or vehicle parts for recycling/recovery. Items that might be accepted include but are not limited to cars, trucks, farm equipment, construction equipment, and respective vehicle parts. These facilities were

obtained from EPA's publicly available DDRT. Version 7.0 of I-WASTE includes 2,484 vehicle recycling facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.4 Wastewater Treatment Facilities

The following types of decontaminated wastewater facilities are included in the tool:

- Centralized Waste Treatment (CWT) Facilities;
- Federally Owned Treatment Works and
- Publicly Owned Treatment Works.

7.4.1 Centralized Waste Treatment (CWT) Facilities

The original list of CWT facilities was obtained from EPA's Office of Water. The list was used for the promulgation of the effluent guidelines for the CWT industry and is dated February 16, 2000. It is contained in the Centralized Waste Treatment regulatory record at Document Control Number (DCN) 33.2.4. In 2016, the list of CWTs in I-WASTE was revised using updated information collected by EPA's Office of Water. While this list was developed for purposes different than those related to managing incident waste, it represents the most comprehensive publicly available list of CWTs. In addition to the list of facilities used for the promulgation of effluent guidelines for CWTs, EPA's Office of Water reviewed the rulemaking record supporting effluent guidelines for unconventional oil and gas extraction; EPA's work with effluent guidelines program plans under section 304(m) of the Clean Water Act; information provided by EPA Regions and state and local government agencies; literature and periodicals, facility and technology vendor websites and newsletters, and conference proceedings; and EPA data systems such as ECHO, Envirofacts, and EPA's DMR Pollutant Loading Tool. The list might include facilities that are no longer operating or now accept different waste or have changed names or ownership. Facilities noted as accepting wastes specifically from oil and gas extraction were excluded from I-WASTE. Publicly available data were used to supplement geographic location data, where possible. Version 7.0 of I-WASTE includes 227 CWT facilities. Data presented in I-WASTE were last refreshed from the source in December 2016.

7.4.2 Federally Owned Treatment Works

Federally Owned Treatment Works were obtained from EPA's publicly available ECHO application. ECHO was queried for water facilities with a Standard Industrial Classification code of 4952 or a North American Industry Classification System (NAICS) code of 2213, 22132, or 221320 and a permit status of "effective, expired, administratively continued," or "pending." Version 7.0 of I-WASTE includes 167 FOTW facilities. Where available, a link to the facility's ECHO Detailed Facility Report is provided. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.4.3 Publicly Owned Treatment Works

Publicly Owned Treatment Works were obtained from EPA's publicly available ECHO application. ECHO was queried for water facilities with an owner/operator designation of "POTW" and a permit status of "effective," "expired," "administratively continued," or "pending." Version 7.0 of I-WASTE includes 16,038 POTW facilities. Where available, a link to the facility's ECHO Detailed Facility Report is provided. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.5 Other Facilities

Several other types of disposal facilities are also included in the tool, including:

- Commercial Autoclaves;
- Commercial Radioactive Waste Disposal Facilities;
- Electric Arc Furnaces;
- Federal Radioactive Waste Disposal Facilities;
- Rendering Facilities;
- Sewage Sludge Incinerators; and
- Wood-Fired Boilers.

7.5.1 Commercial Autoclaves

A list of the largest commercial autoclaves was compiled with the assistance of state and industry stakeholders, particularly Stericycle, Inc. The internal database was updated in March 2012 to add contact information located through internet searches. The database was updated in 2015 based on internet searches of Stericycle facilities and state regulatory agency websites. The database was last updated in 2016 using state agency lists for Arizona, California, Florida, Georgia, North Carolina, and Ohio. Version 7.0 of I-WASTE includes 81 commercial autoclave facilities. Data presented in I-WASTE were last refreshed from the source in 2016.

7.5.2 Commercial Radioactive Waste Disposal Facilities

The list of commercial radioactive waste disposal facilities was collected from a variety of publicly available internet sources, including the U.S. Nuclear Regulatory Commission's website¹⁴. Contact information for the commercial facilities was also collected from the websites of either the facility or the corporate website of the facility owner/operator. Disposal capacities for the commercial facilities were collected from the following sources:

1. Chem-Nuclear Systems Barnwell Disposal Facility: "Barnwell Disposal Capacity Projection South Carolina Energy Office Radioactive Waste Disposal Program." March 27, 2007.
2. EnergySolutions LLC Clive Disposal Site: "Minutes of the Utah Radiation Control Board." June 1, 2007.

3. U.S. Ecology Washington, Inc.: “Low-Level Radioactive Waste — Disposal Availability Adequate in the Short Term, but Oversight Needed to Identify Any Future Shortfalls.” United States General Accounting Office. GAO-04-064. June 2004.

Version 7.0 of I-WASTE includes six commercial radioactive waste disposal facilities. Data presented in I-WASTE were last refreshed from the source in 2015.

7.5.3 Electric Arc Furnaces

Three sources of data were used to compile the original electric arc furnace list. The first was the 2003 National Emissions Inventory (NEI), which listed 95 sites. Data available from the NEI included facility name, address, city, and the latitude and longitude coordinates. The second data source was the 2003 Electric Arc Furnace (EAF) Roundup from the Association for Iron and Steel Technology (AIST). In addition to location information, the 2003 Roundup contained numbers of furnaces as well as production data. The third data source was the 2006 Directory of Iron and Steel Plants, also from AIST. This source provided contact information for all facilities.

Each of the internal databases contributed a unique set of data characterizing each arc furnace. NEI and EAF Roundup data were initially integrated and cross-referenced to match facilities from each data source. Duplicate facility records were merged and where uncertainty about potential duplicates existed, web searches were conducted for maps, corporate websites, and press releases that would help resolve whether two facilities were duplicates of each other or had been closed.

Lastly, contact and location information for each facility was added from the 2006 AIST directory. If a facility was not in the directory, internet searches were performed for corporate headquarters contact information. Typically, corporate websites only included contact information on how to reach a central office rather than plant-specific information.

The electric arc furnace database of facilities was updated in 2009 using the 2009 Directory of Iron and Steel Plants from AIST and the 2005 NEI. In December 2010, the electric arc furnace database was updated with information from the 2010 EAF Roundup from AIST. The database was updated again in 2015 based on data obtained from the 2013 NEI. Version 7.0 of I-WASTE includes 179 electric arc furnace facilities. Data presented in I-WASTE were last refreshed from the source in 2015.

7.5.4 Federal Radioactive Waste Disposal Facilities

The internal list of federal radioactive waste disposal facilities was derived from the following source: “The Current and Planned Low-Level Waste Disposal Capacity Report, Revision 2” (December 2000). U.S. Department of Energy, Office of Environmental Management. Retrieved in December 2008.

Contact information for the federal disposal facilities, or for the host DOE National Laboratory sites where specific facility contact information could not be identified, was located from the internet through publicly available information. Version 7.0 of I-WASTE includes five federal radioactive waste disposal facilities. Data presented in I-WASTE were last refreshed from the source in 2015.

7.5.5 Rendering Facilities

The rendering facilities database accessible through this tool comprises companies identified as producers of animal fats and proteins by the North American Renderers Association (NARA)¹⁵. This information was obtained from the NARA's public active member directory that was last updated in June 2020. Users are encouraged to contact the facility using the provided contact information to confirm that the facility is operating and will accept specific animal material. This database does not include NARA members identified as associate members (including brokers and equipment manufacturers) or international members. Version 7.0 of I-WASTE includes 143 rendering facilities. Data presented in I-WASTE were last refreshed from the source in February 2021.

7.5.6 Sewage Sludge Incinerators

Sewage sludge incinerator facilities were identified in EPA's internal Inventory Database for the Sewage Sludge Incinerator Source Category compiled in 2010 and updated in 2016. The facilities scheduled to cease operation were excluded. Some sewage sludge incinerator facilities were obtained from the EPA's 2012 Clean Watersheds Needs Survey Detailed Report. Version 7.0 of I-WASTE includes 81 sewage sludge incinerators. Data presented in I-WASTE were last refreshed from the source in September 2020.

7.5.7 Wood-Fired Boilers

Data for wood-fired boilers were compiled from three sources:

- NEI – EPA's National Emissions Inventory was last conducted in 2002 and was primarily comprised of data acquired from state agencies. NEI uses Source Classification Codes (SCC) and Standard Industrial Classification (SIC) codes to identify fuel types and industry sectors. In the 2002 NEI, 1,520 wood-fired boilers in the pulp and paper industries were listed.
- Industrial Combustion Coordinated Rulemaking (EPA) – This database used survey data collected in 1996-1997 and contains facility, fuel, and emissions data on 4,446 boilers in use at pulp and paper mills, 721 of which were listed as wood-fired boilers. The data include capacity data and supplemental fuel usage for some of the units. Addresses of the facilities were also provided. The survey used to collect these data, however, was not a complete survey of the industry and therefore the list of boilers provided by this resource is not complete.
- Lockwood-Post's Directory of the Pulp, Paper, and Allied Trades – Lockwood-Post's directory provides a listing of all major pulp and paper mills across North America and Latin America, with profiles of onsite equipment, production capacity, and location. Data for mills with wood-fired boilers were retrieved from the 2002 directory.

Data from each of the three sources were compiled into a single file and condensed down to facility-specific records. Fields such as Facility Contact Name, Facility Contact Phone Number, Latitude, and Longitude were also imported from the native files. Once the data were compiled and formatted properly, duplicate facilities were identified. In cases where duplicates were identified, NEI-native records were retained, as the NEI is the most recent and complete data source. If any additional information existed in the duplicate Industrial Combustion Coordinated Rulemaking or Lockwood-Post record that was not present in, or was less specific than, the NEI data for that facility, the data were copied to the NEI record.

In December 2010, the wood-fired boiler database was updated using the 2005 NEI and a survey database containing results of the 2008 EPA Questionnaire for Boilers, Process Heaters, and other Combustion Units (Information Collection Request (ICR) No. 2286.01) April 30, 2010 - National Emission Standards for Hazardous Air Pollutants for Area Source Industrial/Commercial/Institutional Boilers: Proposed Rule. In 2015, the wood-fired boiler database was updated with new information from the 2013 NEI database. Version 7.0 of I-WASTE includes 901 wood-fired boiler facilities. Data presented in I-WASTE were last refreshed from the source in 2015.

7.6 Government-Owned Land/Facilities

The government-owned land/facilities database contains data on name, owning agency, state, and size, and was retrieved from the federal lands map layer provided by the National Atlas of the United States (a part of the U.S. Department of Interior). This database includes government land/facilities that are greater than 640 acres (approximately one square mile).

Taking into consideration the potential use of federal land/facilities for temporary storage or as transfer stations, a decision was made to include sites with an administrator listed as the Department of Defense (DOD), DOE, or the USDA only. Additionally, national cemeteries were excluded from the database. Version 7.0 of I-WASTE includes 420 government-owned land/facilities records. Data presented in I-WASTE were last refreshed from the source in December 2015.

Note: the contact person provided in the database might not have the decision-making authority to commit the site for its intended purpose but is a starting point from a management perspective.

8 GUIDANCE & INFORMATION

I-WASTE does not promulgate any new guidance but has links to existing guidance documents for various activities. Guidance and information related to managing incident-related waste are available in the tool. The Guidance and Information area of I-WASTE provides a compilation of documents and resources related to specific categories of events, as shown in Figure 11. Users

can view guidance and information related to chemical/biological incidents, radiological/nuclear incidents, natural disasters, agricultural/foreign animal disease incidents, and incidents affecting critical infrastructure. Users access the Guidance and Information page by clicking **Guidance & Information** from the home page.

Users will be presented with a portal of quick links, reports, guidance, and other resources. A brief description of what users can expect to find within each event area is described below. Users can click **View More** to access event-specific information. In addition, access to guidance contained throughout the tool is available, as well as to the compendium of useful documents and reports. Users can select an event and corresponding topics to narrow their search results by using the drop-down lists in the **Browse Resources** box.

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[Treatment & Disposal Facilities](#)

[Guidance & Information](#)

Guidance & Information

I-WASTE does not promulgate any new guidance but has links to existing guidance documents for various activities. Guidance and information related to managing incident related waste are organized and tailored to specific categories of events and accessible through the links below.

Chemical/Biological

Provides access to contaminant and decontaminant agent information. Detailed information on building debris contaminated by biological or chemical agents is also available, along with sample building inventories.

[View More >](#)

Radiological/Nuclear

Provides access to information on nuclear materials, nuclear incidents and cleanup, radioactive waste, regulations, and properties of selected radionuclides. Guidance and documents on radioactive waste types, waste treatment, and disposal is available.

[View More >](#)

Natural Disaster

Addresses disposal of waste and debris resulting from a natural disaster. Provides access to case studies, preparedness guidance documents, and applicable rules and regulations.

[View More >](#)

Agricultural Incidents & Foreign Animal Disease

Provides access to information related to the disposal of animal carcasses in the aftermath of an event. Disposal hierarchies and training modules can be accessed, as well as information on pathogens and past events.

[View More >](#)

Critical Infrastructure

Provides access to information related to water contaminant information and equipment associated with water systems.

[View More >](#)

Browse Resources

Choose a resource type, followed by event and topic of interest to view a list of relevant resources.

Resource Type
☐ Documents & Reports ☐ Guidance

Event Type

Topic

[Search](#)

Quick Links

- [Treatment & Disposal Facilities](#)
- [Disposal Guidance](#)
- [Size Reduction Guidance](#)
- [Packaging/Container Guidance](#)
- [Hazardous Waste Transportation Regulations](#)
- [Waste Transportation Guidance](#)

Other Resources

- [Key Terminology](#)
- [Response Management Jurisdictional Boundaries](#)
- [Regional, State, and Local Contacts](#)
- [Other Planning & Response Tools](#)
- [Laboratory Information](#)

Figure 11. Guidance & Information page.

8.1 Chemical/Biological Related Guidance

Users can access guidance and functionality specific to chemical/biological events, including:

- **Chemical/Biological and Decontamination Agent Information** – View detailed information available for chemical agents, biotoxins, biological agents, or decontamination agents. Hyperlinks to Material Safety Data Sheets (MSDSs)/Safety Data Sheets (SDSs), Centers for Disease Control and Prevention (CDC) Fact Sheets, and PPE guidance provide users access to additional information. Figure 12 displays the Chemical/Biological and Decontamination Agent Information page.

The screenshot shows the EPA's Incident Waste Decision Support Tool (I-WASTE DST) interface. The top navigation bar includes links for Environmental Topics, Laws & Regulations, and About EPA, along with a search bar and links for Developers, Help, and Contact Us. The main header reads "Incident Waste Decision Support Tool (I-WASTE DST)". Below this is a secondary navigation bar with icons and labels for "Waste Materials Estimator", "Treatment & Disposal Facilities", and "Guidance & Information". The "Guidance & Information" section is active, displaying the "Chemical/Biological and Decontamination Agent Information" page. On the left is a sidebar menu with options: "Chemical/Biological", "Chemical/Biological and Decontamination Agent Information" (selected), "Sample Building Inventories", and "Building Waste Characteristics". The main content area has a title "Chemical/Biological and Decontamination Agent Information" and a descriptive paragraph about contaminants. Below this are sections for "Contaminants" and "Decontaminants", each with dropdown menus for "Chemical Agents", "Biotoxins", "Biological Agents", and "Decontamination Agents". A "More Information" sidebar on the right lists links to "EPA's Computational Toxicology Dashboard" and "CBRN Quick Reference Guides".

Figure 12. Chemical/Biological and Decontamination Agent Information page and left navigation menu.

- **Sample Building Inventories** – View representative building waste inventories for the following:
 - Airports,
 - Individual Walled Offices,
 - Open-Space Cubical Offices,
 - Elementary Schools,
 - Middle Schools,
 - High Schools,
 - Hotels,
 - Movie Theaters,
 - Hospitals,
 - Shopping Malls,
 - Single Family Residences, and
 - Underground Transportation Stations.

- **Building Waste Characteristics** – Access characteristics of building waste for over 900 items. Default values for weight, volume, and dimensions can be viewed. The item inventory can also be downloaded or accessed via an API.

8.2 Radiological/Nuclear Related Guidance

The radiological/nuclear related guidance provides access to information on nuclear materials, nuclear incidents and cleanup, radioactive waste, regulations, and properties of selected radionuclides. Users can access information and guidance on the topics listed below and access functionality to search for information that is specific to radiological/nuclear events using the corresponding left navigation menu items, as shown in Figure 13:

- Incident Response and Cleanup Information;
- Radiological Dispersal Device (RDD) Information;
- Low-Level Radioactive Waste Compacts;
- Radionuclide Information;
- Radioactive Materials & Waste Regulations; and
- Nuclear Materials.

Additional information available from the Basic Information page includes quick access to information on radiological incidents, nuclear materials, and radioactive wastes.



Figure 13. Radiological/Nuclear – Basic Information page and left navigation menu.

8.3 Natural Disaster Related Guidance

The natural disaster related guidance addresses disposal of waste and debris resulting from a natural disaster and is designed to provide access to case studies, preparedness guidance documents, and applicable rules and regulations. Users can access guidance and functionality specific to natural disaster events using the following left navigation menu items, as shown in Figure 14:

- Case Studies by Natural Disaster Event Type – Access brief descriptions of types of natural disaster events, along with information about the types of debris expected to be generated and links to relevant case studies.
- Waste & Debris Fact Sheets – Access over twenty fact sheets that address disposal issues related to special considerations waste.
- Regulations, Guidance, and Facilities – Access links to related content and “canned” queries to access categories of facilities.
- Debris Management Equipment – Access an inventory of FEMA debris removal equipment.
- Planning Documents – Access a library of natural disaster case studies, preparedness guidance documents, and planning documents.

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Incident Waste Decision Support Tool (I-WASTE DST)

Waste Materials Estimator

Treatment & Disposal Facilities

Guidance & Information

Natural Disaster

Case Studies by Natural Disaster Event Type

Waste & Debris Fact Sheets
Regulations, Guidance, and Facilities
Hazardous
Transportation Regulations
Other Disposal Guidance
Hazardous Waste Disposal Facilities
Non-Hazardous
Disposal Guidance
Disposal Facilities
Recycling Guidance
Recycling Facilities
Debris Management Equipment
Planning Documents

Case Studies by Natural Disaster Event Type

Brief descriptions of types of natural disaster events are presented below, along with information about the types of debris expected to be generated and links to relevant case studies.

- [Earthquake](#)
- [Flooding](#)
- [Hurricane](#)
- [Tornado](#)
- [Wildfire](#)

Earthquake

An earthquake is a naturally induced shaking of the ground, caused by a major shift of rock along a fracture in the earth's crust. Typically earthquakes generated near the surface are the most damaging due to their close proximity to the built environment (ref: <http://www.answers.com/topic/earthquake> DISCLAIMER).

Earthquakes are relatively infrequent compared to the other types of natural disasters; however they can bring down buildings and infrastructure in a localized area and damage buildings and other structures in a far wider area.

Typical debris generated as an aftermath of an earthquake include building and infrastructure damage, damage to equipment and personal property from collapsed walls and roofs and sediment from earthquake induced landslides.

Unlike hurricanes and floods, an earthquake will also generate ash and charred wood debris. An earthquake will also produce considerable amount of sediment debris.

Case Studies:

[Integrated Waste Management Disaster Plan, Case Studies, Northridge Earthquake](#) DISCLAIMER

Figure 14. Natural Disaster - Case Studies by Natural Disaster Event Type page and left navigation menu.

8.4 Agricultural Incidents & Foreign Animal Disease Related Guidance

The agricultural incidents and foreign animal disease guidance provides users access to information related to the disposal of animal carcasses in the aftermath of an event. Waste management hierarchies and training modules can be accessed, as well as information on pathogens and past events. Users can access information and guidance on the topics listed below and access functionality to search for information that is specific to agricultural incidents and foreign animal disease events using the corresponding left navigation menu items, as shown in Figure 15:

- Pathogen Information;
- Agricultural Waste Disposal Guidance;
- Training Modules; and
- Case Studies.

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Incident Waste Decision Support Tool (I-WASTE DST)

Waste Materials Estimator

Treatment & Disposal Facilities

Guidance & Information

Agricultural Incidents & Foreign Animal Disease

Pathogen Information

[Agricultural Waste Disposal Guidance](#)

[Training Modules](#)

[Case Studies](#)

Pathogen Information

- [African Horse Sickness](#)
- [African Swine Fever](#)
- [Akabane Virus](#)
- [Avian Influenza](#)
- [Bovine Spongiform Encephalopathy](#)
- [Classical Swine Fever](#)
- [Contagious Bovine Pleuropneumonia](#)
- [Coxiella Burnetii \(Q Fever\)](#)
- [Eastern Equine Encephalitis](#)
- [Ehrlichia Ruminantium \(Heartwater\)](#)
- [Exotic Newcastle Disease](#)
- [Foot-and-Mouth Disease](#)
- [Japanese Encephalitis](#)
- [Nipah and Hendra Viruses](#)
- [Rift Valley Fever](#)
- [Rinderpest](#)
- [Venezuelan Equine Encephalitis](#)

African Horse Sickness

[Animal Diseases Card: African Horse Sickness \(PDF\)](#) (5 pp, 80K), World Organization for Animal Health (OIE), 2002

[African Horse Sickness Fact Sheet](#), Canadian Food Inspection Agency, 2009

USDA Resources

- [Carcass Management Dashboard](#)
- [Animal Health Emergency Management](#)
- [National Animal Health Emergency Management System \(NAHEMS\) Guidelines](#)

Figure 15. Agricultural Incidents & Foreign Animal Disease – Pathogen Information page and left navigation menu.

8.5 Critical Infrastructure Related Guidance

Access to information related to the disposal of materials resulting from compromised critical infrastructure components is accessible from the left navigation menu items, including information that addresses disposal issues resulting from chemical or biological contamination of water systems as shown in Figure 16. Users can access end user items and other equipment that might be found in wastewater treatment, distribution system, and drinking water treatment systems. Users can also access water contaminant summary information and link to EPA’s Water Contaminant Information Tool¹⁶, which requires a separate user ID and password to access.

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Incident Waste Decision Support Tool (I-WASTE DST)

Waste Materials Estimator

Treatment & Disposal Facilities

Guidance & Information

Critical Infrastructure

View Agent Information
View End User Items
View Other Equipment

View Agent Information

Water contaminant information can be accessed by selecting a contaminant agent below. Click View Agent Information to view agent summary information.

Contaminant Agents:

Aldicarb

Visit [EPA's Water Contaminant Information Tool \(WCIT\)](#) DISCLAIMER for more detailed contaminant information. Note that you must have an active EPA Central Data Exchange (CDX)/WCIT user account (separate user ID and password) to access the WCIT tool.

Aldicarb

CAS Number:	116-06-3
Contaminant Type:	Pure agent
Contaminant Description:	In its pure form aldicarb is a white crystalline solid with a slight sulfurous odor. It is a non-volatile carbamate compound and is used as an insecticide.
Physical Form:	Solid - crystal
Chemical Formula:	C7H14N2O2S

Figure 16. Critical Infrastructure – View Agent Information page and left navigation menu.

8.6 Browse Resources

Users can access documents and reports that have been indexed to specific event types and topics using the Browse Resources functionality. In the corresponding box, users can specify whether to search **Documents & Reports** or **Guidance** incorporated throughout I-WASTE. Users can then select an Event Type and a Topic and click the **Search** button. If **Documents & Reports** is selected, the user is presented with a results page displaying the documents associated with the event and topic that the user selected, as shown in Figure 17. Users can select “All event types” to view all documents and reports.

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Incident Waste Decision Support Tool (I-WASTE DST)

Waste Materials Estimator

Treatment & Disposal Facilities

Guidance & Information

General Guidance

- Quick Links
- Treatment & Disposal Facilities
- Universe of Facilities
- Disposal Guidance
- Size Reduction
- Packaging/Container Guidance
- Transportation Regulations
- Waste Transportation Guidance
- Other Resources
- Key Terminology
- Response Management
- Regional, State, and Local Contacts
- Other Planning & Response Tools
- Laboratory Information

Browse Documents and Reports

Chemical/Biological - Disaster Response Documents

Some links presented on this page may provide access to external websites. [DISCLAIMER](#)

[FEMA National Response Framework.](#)
By: FEMA

Presents the guiding principles that enable all response partners to prepare for and provide a unified national response to disasters and emergencies – from the smallest incident to the largest catastrophe. The Framework establishes a comprehensive, national, all-hazards approach to domestic incident response, January 2008.

[CDC Bioterrorism Emergency Preparedness and Response.](#)
By: Centers for Disease Control and Prevention (CDC)

Provides fact sheets for various biological agents; planning, communication, and training resources; laboratory information; and guidance for first responders.

[CDC Chemical Emergency Preparedness and Response.](#)
By: Centers for Disease Control and Prevention (CDC)

Provides fact sheets for various chemical agents; information for professionals and the public; planning, communication, and training resources; laboratory information; and guidance for first responders.

[More Information](#)

Additional information may also be available by searching [EPA's Science Inventory](#).

Figure 17. Browse Resources - Documents & Reports results page.

If **Guidance** is selected, the user is presented with links to guidance pages within I-WASTE that match the search selections. The user can access the guidance page associated with the topic that was selected. Users need to specify an event and a single topic to view guidance.

8.7 Quick Links

Links to sought-after guidance are available to users in a **Quick Links** panel in the lower left of the page (see Figure 11). The quick links include access to:

- Treatment & Disposal Facilities;
- Disposal Guidance;
- Size Reduction Guidance;
- Packaging/Container Guidance;
- Hazardous Waste Transportation Regulations; and
- Waste Transportation Guidance.

8.8 Other Resources

Links to other useful resources are available to users in the lower right panel of the page (see Figure 11). The other resources include access to:

- Key Terminology – Defines terminology used throughout the tool that might be subject to varying interpretation by different user groups is described to provide context and meaning for its use within I-WASTE;
- Response Management Jurisdictional Boundaries – Provides links to agencies that have specific emergency support functional roles;
- Regional, State, and Local Contacts – Provides links to contacts of entities that support response activities;
- Other Planning & Response Tools – Provides a links to other planning and response tools that might be useful; and
- Laboratory Information – Provides links to laboratory resources.

9 REFERENCES

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